Mobile Computing Device Short Form Interview Test

FINAL

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EXECUTIVE SUMMARY

As part of the research and planning for the 2010 census, the Mobile Computing Devices (MCD) Working Group chartered a subteam to test the feasibility of conducting interviews on a Mobile Computing Device (MCD). On June 26 - 28, 2002, the test was conducted at Headquarters with 12 Senior Field Representatives (SFR's) and Field Representatives (FRs) from the Census Bureau's Regional Offices (ROs). Eleven of the twelve participants in the test had Computer Assisted Personal Interviewing (CAPI) experience.

What were the objectives of this test ?

The MCD Working Group defined two objectives:

1) To make an initial assessment of the feasibility of using MCD's to collect census short form data.

2) To observe and rate the interviewers' responses to multiple data collection input methods on an MCD in an interview situation. (This included input methods specific to the device, such as a stylus, and input methods specific to the software, such as number slides.)

What were the assumptions and guidelines for the test ?

The MCD Working Group provided the team with the following assumptions and guidelines:

- Keep the test as simple as possible;

- Use only commercial off-the-shelf software;

- Use different types of hand-held devices with different screen sizes;

- Include input methods specific to the devices to gauge the interviewers' reactions and opinions. The methods included input via the stylus, number slides, etc.

What hardware and software were used for the test?

Hardware

The hardware used for the test, the HP Jornada 564 and the HP Jornada 720, were chosen by the MCD Working Group for use in initial feasibility testing. The MCD Working Group chose these devices because:

- They had different screen sizes and different input methods. The HP Jornada 564 is a typical Pocket PC device with a small rectangular screen that uses a stylus and a virtual keyboard for input. The HP Jornada 720 is a clamshell-type device with a long rectangular screen that uses a physical keyboard and stylus for input.

- Both devices have long battery life

- The battery on each device could be swapped (changed) without losing data on the device.

- They were considered "best in class"of the devices that TMO had already purchased. (See 2/7/2002 MCD Working Group Meeting Notes)

Software

The test team chose FIELDWORKER 3.5 as the software for the short form census test. The reasons for choosing FIELDWORKER included:

- FIELDWORKER offered a Rapid Application Development tool for developing custom forms for data collection.

- FIELDWORKER was supported by the Pocket PC operating system.

- FIELDWORKER offered many different data input methods such as: Sketch Pads , Nested Picklists, and check boxes.

Where was the test conducted?

The test was conducted at Census Headquarters in Suitland, MD. The respondents were self selected Headquarters employees.

What was the test design?

The test design utilized the general methodology used by the Computer Assisted Survey Research Office (CASRO) for the Pen Computer Test conducted in the fall of 2001, and the MCD Map Usability test conducted in Gloucester County, VA in May of 2002. The test design included the following:

- Breaking the group into two groups, training one group on one device and the other group on the other device.

- After training, each group used the device to complete interviews of HQ staff they encountered at various locations on the Suitland campus. The questionnaire used was a modified version of the census short form.

- On day two, the groups were debriefed separately on their experiences with the device.

- After the second day debriefings, the groups were trained on the other device.

- After training, each group completed more cases using the new device they had just been trained on.

- The third morning the groups were debriefed separately on their experiences with the second device they had used.

- After the second device debriefing, the groups were brought together for a general debriefing.

- Observers accompanied field representatives and recorded observations on what the field representative experienced .

What were the findings?

The team considered the test to be a success. Below are some of the major findings:

- All of the FRs believed that they could do their job with this type of device.

- All of the FRs completed numerous interviews during the test. Interview time became shorter as interviewers became comfortable with using the device(s).

- The interviewers were split evenly in their preference for either the 564 or the 720. Interestingly, they all seemed to prefer the device they had used on the second day.

- All of the FRs thought using an MCD would have a positive impact on their job, rather than a negative one.

- The COTS software utilized in this test is not a viable option for instrument development at this point since it lacked the maturity needed for a person-based instrument of this complexity.

- There are inherent problems using either of the two devices that must be considered before any implementation; namely, the devices were slow while painting screens [may be corrected with a quicker processor], the 720 HP Jornada screen was unusable in direct sunlight, and the virtual keyboard obscured the HP 564 screen while in use.

- A major factor was the use of CAPI experienced FR s. Results may have been different if 'novice users' were used in this test.

- The Frs were able to adapt to the various input methods presented. The conclusion was that consistent input methods should be utilized throughout the instrument, and which input methods are utilized should be examined in relation with the question being asked.

What are the recommendations?

- The team recommends further testing of the use of MCD's with a focus on enhancing instrument design. This is critical for the success of the 2004 test. Simplicity and user friendliness are the keys.

- Usability testing is needed to evaluate and improve the effectiveness of the interviewers' interaction with the software and the device.

- The team suggests that a single type of device be selected for the future tests.

Short Form Census Field Test Overview:

The team feels that it is critical to keep this test very focused and very simple.

Timing: This test will be conducted over a three day period no later than Fall 2002. An interviewer debriefing report and a detailed observation report will be prepared within two weeks of the completion of the test. A summary report containing an executive summary, results and recommendations, will be prepared within 4 weeks of the completion of the testing.

Goals*:*   To make an initial assessment of the feasibility of using MCD's to collect census short form data. Locating addresses is out-of-scope for this phase of testing.

To observe and rate the interviewers' responses to multiple data collection input methods on an MCD in an interview situation.

This includes input methods specific to the device, such as a stylus, and input methods specific to the software, such as number slides. To the extent possible the instrument will contain a variety of input methods in order to gauge interviewer reactions and opinions.

To observe and rate interviewers' overall ability to conduct an interview on an MCD.

Questionnaire: The test questionnaire will consist of some or all of the interview questions used in the 2000 NRFU operation. To the extent possible the 2000 NRFU questionnaire will be converted to an automated format.

The questionnaire will not be a full fledged questionnaire with all the appropriate edits and paths (e.g., no outcome coding). It *will* contain both internal edits and multiple paths. It will allow for rostering of households with more than 6 members, although for test purposes, smaller households will be used more often since they will allow time for more interviews to be completed.

The questionnaire will incorporate multiple data input methods. For example: drop downs, pick lists, number pads, check boxes, slides, signatures, notes, time-stamps etc. Special attention will be paid to the more complex questions such as race and relationship. It is anticipated that nested pick lists will be used for these questions.

The questionnaire will have some screens that require scrolling up and down and some screens that require scrolling from side to side. We need to observe how

this affects the interviewers' ability to complete an interview.

Devices: This test will be conducted using the same hardware that is used in the map feasibility testing. We will have each interviewer conduct interviews using both of the devices.

Duration: Three days including training and debriefing.

Training: Minimal training (no more than 2 or 3 hours) will be provided since one of our goals is to have the instrument be as intuitive as possible. Prior to training the interviewers we will conduct a dry run of the training.

"Respondents" and observers will attend a briefing prior to day one so they will clearly understand their roles. Observers will attend a debriefing after the test. "Respondents" will be invited to the debriefing as well.

Interviewers: A maximum of 14 interviewers will be selected from 3 or 4 regional offices and HQ. These interviewers will be brought into headquarters and trained on using the MCD's. To the extent possible the interviewers will have a variety of experience. That is; some with only PAPI experience (preferably NRFU), some with CAPI experience and some with no interviewing experience (could be HQ staff). If possible we would like to bring in 2 of the Charlotte RO FRs who participated in the dry run of the Map Feasibility test.

The interviewers will be broken up into 2 groups of 7. We will attempt to have the groups balanced for experience. In addition at the start of training we will have each interviewer complete a short questionnaire detailing their interviewing experience and their experience with computers and with smaller handheld devices.

Respondents: HQ Census Bureau staff will be used as respondents.

Interviews: Interviewers will conduct about 8 - 12 "personal visit" interviews (at least 4 with each device) using Census Bureau employees as respondents. The census respondents will be given scripted responses for the interviews. The scripted responses are necessary to ensure that certain features are encountered during the interview. Each scenario will be used more than once. Each scenario will be assigned to be used with each device at least once. Interviewing conditions will be varied and be as realistic as possible e.g., outdoors, standing in a doorway

Debriefing: Formal interviewer debriefing sessions will be conducted at the start of the second and third days. A debriefing report will be prepared.

Observers: Observers will be members of this test plan team and of the parent MCD working group or other R & D groups. Observers will prepare written observation reports and participate in a formal observer/respondent debriefing.

Data: The data output from the interviews will be compiled in a database. This data will be examined for missing data due to interviewer error. We are not interested in instrument error for the purposes of this test.

Test Schedule:

Preparation	
Dry Run ½ day	Respondent & Observer Briefing 1-2 hours

Test					
Day 1		**Day 2**		**Day 3**	
Group 1	**Group 2**	**Group 1**	**Group 2**	**Group 1**	**Group 2**
Train on Device A	Train on Device B	Debrief on device A	Debrief on device B	Debrief on device B	Debrief on device A
Interview using device A	Interview using device B	Train on device B	Train on device A	Debrief both groups together on MCD's for interviewing	
		Interview using device B	Interview using device A		

Observers & Respondents
Debrief on test

Resulting Data

Upon the completion of the Mobile Computing Device (MCD) Interview Test, all data collected was removed from the MCDs to be analyzed. The following information below are highlights of the data collected during the 2 days of interview of HQ staff:

Total Complete Interviews used for analysis	73 cases
Average Time for interview	10.27 minutes
Total Number of Rosters	67 Rosters
Total Person Count	170 People
High Household Count	15 Persons
Low Household Count	1 Person
Number of Cases Complete Per Enumerator	6.08 Cases

Field Representative Feedback

Field Representatives were selected from all of the Regional Offices (except Boston due to scheduling difficulties). The Field Representatives were mostly experienced Computer Assisted Personal Interviewing (CAPI) Interviewers. Observers escorted the Field Representatives while interviews were completed.

At the completion of each day's activities each FR/SFR participant completed a feedback form. The FR/SFR feedback forms were intended to capture the experience of the FR/SFR had with various components of the software and hardware. In total 24 FR/SFR feedback forms were collected and tallied.

Some key findings from these forms are as follows:

• The majority of FR/SFR's had some problems or frequent problems reading the screen of the MCD outdoors in sunlight and to a lesser extent in shade.

• Most FR/SFR's had few problem with the standard tasks such as opening and closing the software turning on the machine etc.

• The feedback form results also show some problems with inputting information into the MCD. More than half of the FR/SFR's had few problem with inputting text, on the 564 in particular. Many FR/SFR's also had problem with and inputting numbers using the numeric slide and almost half FR/SFR's had some problems navigating through the from

• No SFR/FR reported having extreme difficulty overall using the device, yet more than half reported some difficulty.

• The majority of SFR/FR's reported being comfortable using the device, and reported being comfortable within a short period of time and having a low frustration level using the device to conduct interviews.

Mobile Computing Device (MCD) Short Form Test
FR/SFR Feedback Form

Name:	Date: □ Wed, 6/26 □ Thurs, 6/27
	Time: □ AM □ PM
	Machine: □ Jornada 720 (clamshell) □ Jornada 564 (handheld)

Task Specific Information From Today's Interviews

How often did you experience problems with the following:

▸	Touch screen	Rarely/Never	Sometimes	Frequently
▸	Stylus	Rarely/Never	Sometimes	Frequently
▸	Keyboard	Rarely/Never	Sometimes	Frequently
▸	Opening Field Worker software	Rarely/Never	Sometimes	Frequently
▸	Opening cases in Field Worker software	Rarely/Never	Sometimes	Frequently
▸	Using the time/date stamps	Rarely/Never	Sometimes	Frequently
▸	Using scroll up and scroll down function	Rarely/Never	Sometimes	Frequently
▸	Using scroll left and scroll right function	Rarely/Never	Sometimes	Frequently
▸	Selecting items using a check box	Rarely/Never	Sometimes	Frequently
▸	Selecting items from a pick list	Rarely/Never	Sometimes	Frequently
▸	Selecting items from a pick list within a pick list	Rarely/Never	Sometimes	Frequently
▸	Reading questions as worded on form	Rarely/Never	Sometimes	Frequently
▸	Inputting text	Rarely/Never	Sometimes	Frequently
▸	Inputting numbers by typing	Rarely/Never	Sometimes	Frequently
▸	Inputting numbers using numeric slide	Rarely/Never	Sometimes	Frequently
▸	Navigating through the form	Rarely/Never	Sometimes	Frequently
▸	Using the signature feature	Rarely/Never	Sometimes	Frequently
▸	Closing the interview	Rarely/Never	Sometimes	Frequently
▸	Reading the screen outdoors in sunlight	Rarely/Never	Sometimes	Frequently
▸	Reading the screen outdoors in shade	Rarely/Never	Sometimes	Frequently
▸	Reading the screen in flourescent light	Rarely/Never	Sometimes	Frequently

▸ Conducting the interview while standing	Rarely/Never	Sometimes	Frequently
▸ Power Supply	Rarely/Never	Sometimes	Frequently
General Impressions of Today's Interviews:			
Overall, how easy was it for you to conduct interviews using the device?	Had No Difficulty	Had Some Difficulty	Had Much Difficulty
When did you become comfortable using the device?	By Middle of Day	By End of Day	Was Never Comfortable
Overall, how physically comfortable are you when using the device?	Mostly Comfortable	Sometimes Comfortable	Uncomfortable
How often did you look up from the device while asking the questions?	Always/Most of the Time	Sometimes	Rarely/Never
How often did you experience error messages?	Frequently	Sometimes	Rarely/Never
Generally, what was your confidence level when responding to the error messages?	High	Medium	Low
What was your frustration level when using the device to conduct interviews?	Low	Medium	High

Describe the conditions under which you had problems (For example: where were you when you encountered screen glare etc):

Provide any comment you would like to make on the:

▸   Physical comfort of the machine:

▸   Hardware (i.e; keyboard- screen-stylus etc):

▸   Software(i.e; navigation, structure of questions etc.)

▸   Ease of use:

▸   Difficulty of use:

▸   Anything else?

Mobile Computing Device (MCD) Short Form Test
Results from FR/SFR Feedback Form

Table 1. Feedback about MCD Hardware and Software Elements									
Hardware/Software Element by Machine Type	# of FR's who "Rarely/Never" Experienced Problems *			# of FR's who "Sometimes" Experienced Problems *			# of FR's who "Frequently" Experienced Problems *		
	564	720	Total	564	720	Total	564	720	Total
Touch screen	8	7	**15**	4	3	**7**	0	1	**1**
Stylus	9	9	**18**	3	1	**4**	0	2	**2**
Keyboard	8	11	**19**	3	1	**4**	0	0	**0**
Opening Field Worker software	10	9	**19**	1	2	**3**	1	0	**1**
Opening cases in Field Worker software	10	9	**19**	2	2	**4**	0	0	**0**
Using the time/date stamps	12	10	**22**	0	0	**0**	0	2	**2**
Using scroll up and scroll down function	10	8	**18**	2	2	**4**	0	2	**2**
Using scroll left and scroll right function	10	8	**18**	2	2	**4**	0	2	**2**
Selecting items using a check box	10	8	**18**	2	3	**5**	0	1	**1**
Selecting items from a pick list	10	10	**10**	2	1	**3**	0	0	**0**
Selecting items from a pick list within a pick list	10	10	**10**	2	2	**4**	0	0	**0**
Reading questions as worded on form	8	11	**19**	4	1	**5**	0	0	**0**
Inputting text	4	7	**11**	8	5	**13**	0	0	**0**
Inputting numbers by typing	5	9	**14**	6	2	**8**	1	1	**2**
Inputting numbers using numeric slide	6	7	**13**	6	5	**11**	0	0	**0**
Navigating through the form	7	5	**12**	5	5	**10**	0	2	**2**
Using the signature feature	12	9	**21**	0	1	**1**	0	1	**1**
Closing the interview	11	8	**19**	1	2	**3**	0	1	**1**
Reading the screen outdoors in sunlight	7	1	**8**	4	2	**6**	1	8	**9**
Reading the screen outdoors in shade	8	2	**10**	3	6	**9**	1	4	**5**
Reading the screen in flourescent light	9	12	**21**	2	0	**2**	0	0	**0**
Conducting the interview while standing	11	9	**20**	1	2	**3**	0	1	**1**
Power Supply	10	12	**22**	2	0	**2**	0	0	**0**

Table 2. Field Representative "General Impressions" Feedback									
Question from Feedback Form	**Number of FR Responses by Machine Type***								
	720	**564**	Total	**720**	**564**	Total	**720**	**564**	Total
Overall, how easy was it for you to conduct interview using the device?	"Had No Difficulty"			"Had Some Difficulty"			"Had Much Difficulty"		
	5	5	**10**	7	7	**14**	0	0	**0**
When did you become comfortable using the device?	"By the Middle of the Day"			"By the End of the Day"			"Was Never Comfortable"		
	9	10	**19**	1	2	**3**	2	0	**2**
Overall, how physically comfortable are you when using the device?	"Mostly Comfortable"			"Sometimes Comfortable"			"Uncomfortable"		
	11	8	**19**	1	4	**5**	0	0	**0**
How often did you look up from the device while asking the questions?	"Always/Most of the Time"			"Sometimes"			"Rarely/Never"		
	7	7	**14**	5	5	**10**	0	0	**0**
How often did you experience error messages?	"Frequently"			"Sometimes"			"Rarely/Never"		
	0	2	**2**	8	5	**13**	4	5	**9**
Generally, what was your confidence level when responding to the error messages?	"High"			"Medium"			"Low"		
	9	5	**14**	2	5	**7**	0	1	**1**
What was your frustration level when using the device to conduct interviews?	"Low"			"Medium"			"High"		
	10	8	**18**	2	4	**6**	0	0	**0**

* **Response numbers are based 24 FR Feedback forms collected after each day's testing. Note: Some feedback forms had "no answer" for some questions so the sum total of responses is occasionally less than 24.**

FR Debriefing Report
MCD Short Form Test
June 27 - 28, 2002

BACKGROUND

This report presents the results of the debriefings held with the Field Representatives (FRs) for the Short Form Test using the Mobile Computing Devices. Twelve FRs from eleven Regional Offices came to headquarters to conduct the test. All twelve have worked on previous decennial censuses and all currently work on current demographic surveys. Only one FR did not have Computer Assisted Survey Interviewing (CAPI) experience. That is, she has never used a computer to collect data.

The FRs were divided into two groups of six each. The morning of the first day, Group A was trained on the Jornada 564 while Group B was trained on the Jornada 720. After training they spent the rest of the day interviewing Census employees around the Suitland campus. The second morning they were debriefed within their groups on their experiences with the machine they used. After the debriefing, they were trained on the other machine and spent the rest of that day doing assignments with this second machine. On the third day they again were brought in as separate groups to discuss their experiences with the second machine. After that, all FRs met together and talked about both machines in general, which machine they preferred and why.

The first part of this report discusses the FR's overall satisfaction with the machines and how they thought the MCDs could help them to do their job or make their job as enumerators more difficult. It will then detail the comments that the FRs made about the individual machines in the separate group debriefings.

OVERALL SUMMARY

After using the devices to interview for almost a day and a half, FRs reported that yes, they could use a small handheld machine to conduct the short form interview. They found them convenient and lightweight. They also remarked that getting rid of some paper was good.

When asked their preference for the style of machine (the Jornada 564 which was palm sized and used a virtual keyboard vs. the Jornada 720 which was slightly larger and had a physical keyboard attached to the machine), the FRs were evenly split. As a matter of fact, across the board, the FRs preferred the machine they used on the second day. This probably means experience was a more critical factor than machine type.

FRs who liked the Jornada 720 (a clamshell type model) said that having the physical keyboard was a deciding factor. They thought some enumerators may not be able to use a virtual keyboard because of a physical impairment. They said it was harder to type a duplicate letter with the physical keyboard than with the physical keyboard. They also thought the physical keyboard could be used for navigating (e.g., Tab or Enter). They also liked the larger screen with slightly larger font. The larger screen meant there was more "dead" space to hit to get out of the question. All but one FR admitted that the screen was not visible in sunlight.

The FRs who liked the Jornada 564 said they like it for visibility — the ability to see it in sunlight. They also thought it responded to touch better than the Jornada 720, was easier to hold, was faster between screens and was lighter in weight. They thought that only using the stylus for input (versus typing on the keyboard with their fingers) was less confusing. They said with a virtual keyboard, they would have the option of an alphabetic layout.

IMPACT ON JOB

FRs were asked how using the mobile computing device would impact the job of an enumerator. On the positive side, they said:

- **Ease of use — device easy to handle, convenient to hold;**
- **No forms;**
- **Allows them to be better organized — all work contained in one place, less clutter, organizes lists/case management, they won't have to shuttle questionnaires;**
- **Less paper — eliminates paper (or there is much less to deal with) the shuttle/bulk that goes with it**
- **Edits/Automation — no need to edit forms, requires/should require completion of all questions, ensures correct skip pattern, easier than following a skip pattern;**
- **Better chance for cooperation from respondents because they don't see the size of the questionnaire and they won't see the same form that they possibly received in the mail and threw away already, less intimidating to respondents;**
- **Eliminates illegible handwriting problems;**
- **Confidentiality — respondents would think it was more confidential because there was no paper hanging around (see negative comments), respondents won't be able to see the questionnaire from another household;**
- **Rapport — respondents will be fascinated with device which will create respondent interest, appeals to the public, respondents expect us to use computers so it gives the enumerator more respect;**
- **Easier to track work;**
- **Efficiency — less time to conduct survey (see negative comments), faster than writing;**
- **Weight — lighter to carry than numerous paper forms, could put in purse;**
- **Fun to use!**

On the negative side, they said:

- **Training — takes longer to learn, might be harder to train wide range of enumerators, need more training (how to use the device);**
- **Speed — slower than paper, frustrating to get the device to respond, too slow between screens;**
- **Hiring enumerators — may be difficult for some people to use (elderly, etc.), may change the caliber of enumerators that we hire (thus making hiring even more difficult), may cause more enumerators to get frustrated and quit if there are**

difficulties using the device.

- **Correcting mistakes — easier to see and correct mistakes on paper, hard to correct mistakes, entries must be very precise, mistakes not tolerated;**

- **Viewing instrument — can not scan entire instrument at once to get a general sense as to whether the form is complete, hard following the household roster;**

- **Screen display — difficult to see in the sunshine, visibility may be a problem in various weather conditions;**

- **Fear of losing data — drop and break machine means losing data, lose interviews when batteries die, possible battery problems;**

- **Hardware/software problems — if hardware or software fail, production will stop**

- **Interview flow — if respondent wanted to hurry the interview it is harder than on paper to follow exact skip pattern;**

- **Confidentiality — concern about big brother, respondent may fear confidentiality;**

- **Breakage/loss — concern about losing or breaking device, worry about theft, may be nervous about dropping;**

- **Fear of program making a mistake;**

- **Need to be precise when using the stylus with the virtual keyboard.**

DETAILS ON DEBRIEFING OF THE JORNADA 720

General Reactions

The FRs liked the using the Jornada 720. They stated reasons such as "easier to handle than a laptop", "liked the keyboard", " stylus felt good", etc.. Although Group A (this group used the Jornada 564 on the first day) found the 720 heavier than the 564, they did not think that this would present a problem. They also found some comfort in the fact that the 720 was similar to their laptops used on current surveys, especially when using the keyboard for data entry. They also noted that the respondents were more intrigued with the 720 than the 564. They felt that this gave them an edge in holding the respondent's attention.

The screen display in bright light was their biggest complaint against this machine. They felt that the 720's screen was not readable at all in the bright sun. They also noted that it was difficult to evaluate the machine given the problems that they encountered with the software.

Physical Features

The FRs noted that the keyboard was a great feature and that it would pass the "fat fingers" test. That is they felt that they could "hunt and peck" on this machine easily. They liked having the keyboard which gave them more options to navigate than with the HP 564. For example, they could use the stylus as well as the keyboard to move from one screen to the next or if the instrument was programmed, they could use the enter key to confirm a response. One FR stated that she would like to have more space between the letters and the numbers on the keyboard. They found the machine easy to hold and liked the placement of the battery because it gave them a better grip on the machine. While they found the 720

heavier than the 564, they felt that they could get used to it after working with it since it was lighter and smaller compared to their laptops. The found the stylus for the 720 bigger and heavier than the 564 which they felt was a positive. They stated that they could check the battery life and change the screen contrast easier than the 564. The battery life was not a problem for this machine.

Some of the FRs found the 720 awkward to hold and had to use the stylus straight on. They would like to have a strap or case to carry the 720 around. They also found the keyboard very sensitive to the touch and found themselves entering wrong information.

The Interview

The FRs were bothered by the fact that they could not see the whole question on the screen. One of the main concerns expressed by the FRs was that the screen was too busy, that it contained too many navigational commands and task bars on the screen. They suggested that some of the task bars and commands could be minimized. They found that the 720, when compared to the 564, had a bigger screen, thus they could see more of the question on the screen. They would like to have had a "jump" key to navigate the instrument. On the HP 720, they would also like to use return/enter keys on the keyboard to navigate the instrument. They liked using the arrow keys for navigation as well and also found the "Windows" key on the keyboard helpful for bringing up the program menu. The FRs found that the instrument needed more space between the "x" and the scroll bar. Since these two commands were so close to each other they found themselves entering the "x" and closing the interview instead of scrolling. Some FRs had difficulty navigating beyond the second and third person. While this problem was mentioned in both groups, not everyone seemed to have this problem.

Some instrument related items mentioned were:

When you opened a case, it opened to the last screen of the questionnaire and you had to backup to the beginning of the case which took some time away from the interview. The arrows found on the bottom of the question screen used to scroll to see the remainder of the question worked well, but were placed too low on the screen therefore went unnoticed at times. On several occasions the instrument would open showing a split screen. For example, the top half of the screen contained the same information as the bottom half. The FRs had to reopen the case in order to start the interview (in one instance the FRs had to reset the machine).

They also found the question titles distracting, the FRs mentioned that in current CAPI surveys they do not have question titles (CAPI surveys do have question titles they are just not as prominent as these titles are). Finally, they wanted the case to "wrap up" automatically as in CAPI surveys.

Input Methods

Entering and reading text did not seem to be a problem when the lighting was not too bright. The FRs used a variety of ways to enter data. For example, some FRs used their stylus to tap on the keys; while others held the device with their left hand then used the left

thumb to key data and held the stylus in their right hand which was used to navigate; some held the HP 720 with both hands and used both thumbs to enter data. While some preferred to use the "hunt and peck" method of data entering, they felt that it was slower than typing. While the keypad/calculator function on the screen was fine, Group A preferred to use the keys on the keyboard for entering numbers. Group B did not like MM/DD/YYYY format for entering date of birth and would prefer to enter m/d/yy.

The FRs said that the keys on HP 720 responded well to their touch, but they found that the screen was not sensitive enough to their touch. One thing they found frustrating was that they did not have an "is working feature" dialogue/indicator so they were not sure if the handheld had accepted their entries or not. They also thought the software should remember the their name, the household names, and that movement from one person to the next should be automatic.

The FRs felt that the time between screens was too slow. They stated that they did not have problems correcting mistakes and felt that with more training and experience they could overcome the deficiencies of the instrument. One final comment from Group A was that they felt that a paper questionnaire was faster to administer than an electronic one.

DETAILS ON DEBRIEFING OF THE JORNADA 564
General Reactions

When asked about their general reactions to the Jornada 564, the FRs who used the devices on the first day had a different reaction than those who used the device on the second day. Those FRs who used the Jornada 564 on the first day (most of whom had never been exposed to a palm-sized device) talked about the size and ease of use. They said the small size meant it fit in their hand and was easy to handle. They wanted the screen size to be a little larger but still wanted the device to fit in their hand. They weren't positive about the virtual keyboard. They said it was too small and hard to use. It didn't help that the virtual keyboard covered the answer spaces for a couple questions. If they had to use the virtual keyboard to write notes about a case, they thought it would be cumbersome.   They were concerned that the device would be difficult for an elderly enumerator to use because of their perceived need for pinpoint accuracy on the virtual keyboard. They thought dexterity and vision limitations may exclude some potential enumerators from using the device.   FRs said it took longer than the promised seven minutes to complete an interview with the device but admitted that it was probably because the instrument wasn't fully automated.   One FR said she had eye strain at the end of the day (NOTE: this FR was the only one who was not a CAPI interviewer — the surveys she interviewed on still used paper questionnaires). A couple of the FRs said their hands/arms were tired by the end of the day from holding either machine.

On the other hand, the FRs who used the Jornada 564 on the second day said they loved it — it was easy to maneuver, they could hold it in their hand and drop it in their purse to keep it secure, and they could see it in bright sunlight. They said their initial concerns for no physical keyboard were unfounded. As a matter of fact, using the stylus only to enter data and navigate through the instrument was seen as an advantage. They also thought that it was lighter in weight than the Jornada 720 that they used the previous day.

Physical Features

<u>Screen</u>

All FRs agreed that the screen of the Jornada 564 was easy to view in the bright sunlight — it was described as "clear and crisp." The verdict on viewability in other lighting conditions was varied. Those who were very positive about the Jornada 564 admitted that there was some glare under the fluorescent lights and said it was sharper than the Jornada 720 in the other lighting conditions. Those who were less positive said there was glare under all conditions except sunlight — in the shade outside, under an awning, in natural light indoors as well as under the fluorescent lights. Only one FR reported that fingerprints on the screen make it hard to see. Only a couple of the FRs adjusted the contrast by pressing and holding the on/off button.

<u>Stylus</u>

Both groups of FRs agreed that they liked the holder for the stylus and thought future machines should have one. They were also concerned about losing the stylus and knew that they would need extra ones. They wanted the stylus to be more visible in the holder — maybe have a red tip so they could get a quick visual confirmation that it was in the holder. They disagreed, however, as to whether they needed the stylus to be on a tether - some thought that it would be too constrictive while others thought it would be fine as long as there was also the holder in which to store the stylus. Some FRs thought the design the Jornada 564 made the stylus hard to get out of the holder when the lid was open.

The first group of FRs said the size of the stylus was not a problem; those who had used the larger stylus on the Jornada 720 the previous day said that this stylus was too short and too thin.

<u>Virtual Keyboard</u>

FRs who used the Jornada 720 with the physical keyboard the first day and the Jornada 564 with the virtual keyboard the second day said they liked to use the stylus with the virtual keyboard because they didn't have to put it down to type on the real keyboard.

One FR did say that she thought the stylus needed a finer point. This may have been an issue with the size of the keys moreso than the stylus design. All FRs said they wouldn't want the virtual keyboard to be any smaller. There was the problem, however, of the virtual keyboard covering up the answer spaces because of its size.

When asked whether they would prefer the standard QWERTY keyboard or an alphabetic keyboard, only two FRs thought they would prefer the alphabetic keyboard. They did ask if keys that aren't used could be removed. They also said the delete button was hard to find.

<u>Buttons</u>

The Jornada 564 had buttons under the screen. FRs said they didn't use these buttons except for the couple of them who adjusted the contrast with the on/off button. When asked what they would like to have these buttons programmed to do, some FRs said they would like a button to take them to the case listing and one to take them to the sign-on screen. Others said they would like a button/icon to be able to jump them to the next unanswered

question (note that for this test, the skip patterns weren't automatic); add notes; and to save a partial interview. One FR said that when she rested her hand on the base of the device, she tended to hit the buttons. This implies we should be careful about any buttons on a machine and make sure that whatever they are programmed to do, it can be easily undone if it was pressed by mistake.

Battery

FRs said the long battery life was convenient. On the first day, four of the six FRs had to come back to get their battery recharged. This was presumably because the battery wasn't fully charged at the beginning of the day. No one on the second day had their battery run low. The low battery did remind the FRs that they wanted to be able to check the battery level on the machine. They also said a warning for low battery is necessary. The Jornada 564 gave them a warning but the FRs didn't know how to react to it. That is, the warning said the battery was low but they didn't know what that meant in terms of how much time they could still work with it. Then before it went off, FRs just got the same warning and then 5,4,3,2,1 and it went off.

Other

All FRs like the lid on the Jornada 564 — they saw it as a protective cover -- but some were afraid that it would break off. They thought that perhaps a cover that folded all the way over would work better.

Some FRs wanted a neck strap to secure the device and prevent it from being lost or dropped. They also discussed the potential problem with getting machines back from enumerators who quit in the middle of their assignment. Sometimes it is difficult to get any materials back from them. This would be another piece of equipment they would have to retrieve.

Most FRs agreed that they liked the feel of the stylus on the screen with the Jornada 720. Some thought it required more pressure than the other machine, some thought it required less pressure, but all agreed they liked the control it gave them.

One FR reported that her hand fell asleep while holding the machine but she still thought the device was comfortable in her hand.

The machine made a clicking noise when keys were pressed. This was OK.

A couple of FRs had to hit the reset button on the Jornada 564. One thought it might be due to the heat or the amount of data that had been stored in machine. Another said her machine locked up after only a couple of interviews and while she was working inside.

FRs liked the fact that the machine returned to the screen it was on when it went off (even after reset).

The Interview

FRs had several comments on how the instrument worked.

They thought scrolling was tedious and slow, especially to get to the top of the roster after entering the second person. In this instance, they thought there should be a button to get to the next person at the bottom of the screen so they didn't have to scroll back up to the top of the screen just to change screens. FRs said they sometimes had problems with the scroll bar — besides being slow when scrolling up and down, they sometimes didn't hit it hard enough to have it move.

The instrument used a slider bar as the input method for number of people in the household and age. FRs thought the slider bar was too sensitive. Some said they ended up using the arrows at either end of the bar to increment the bar. They also thought the range was too large (sliding it a little got the FR up to 185 for age). On the other hand, they liked the calculator to enter numbers such as age. They said a calculator with additional keys such as the slash (/) would be easier than the keyboard to enter date of birth.

FRs mentioned that navigating through the instrument wasn't intuitive. They wanted the navigation to be more consistent. It was especially confusing when adding a new person to the roster. They reported that navigating backward to correct a mistake was hard — need a smoother and faster way to go back. They estimated an average time to complete an interview was seven to 18 minutes. They attributed the length to the lack of automatic skip patterns. They did say, however, that they learned to recover from their mistakes.

Another input method was the drop down boxes. FRs reported having no problem with tapping on the drop down boxes.

FRs reported that the machine was too slow between screens. They thought it was slower than the Jornada 720.

FRs wanted to minimize the use of pop-up windows. It was difficult to hit "dead" space to close the pop-up windows and sometimes they hit a space which activated another function, e.g.; the Start button or an icon on the main screen. They thought if they had a a specific button to use to close the question window (e.g., an X in a red circle), the problem would be minimized. They also didn't like the fact that the pop-up windows covered important information (DOB answer space, address).

On the case assignment screen, the addresses scrolled but the case numbers didn't scroll in tandem with address which meant the case numbers were for different addresses. Another comment on the case assignment screen was that the FRs wanted to be able to see the entire assignment. After they wrapped up a case, it was removed from the list of cases window. (NOTE: There was another window which showed all cases, but the FRs weren't trained on this function.) FRs thought that cases should automatically be wrapped up. After certifying the case, they shouldn't have to go back to the list and remove it. It should be automatically marked as complete.

FRs thought the screen real estate could be better used. They suggested that the header on every screen could be dropped. They also wanted slightly larger font on the screens.

One final suggestion was to have the machine remember the household's last name or have

a "Same" button so they didn't have to keep asking the last name if they didn't remember it.

OTHER COMMENTS

When asked whether enumerators will need a knowledge of computers to do this job, all but two FRs said it wouldn't make a difference. They said you would have to tell applicants that they will use an MCD and this might scare some people off. They thought that people could be trained to use the device. Using any device would mean that you would have to consider an applicant's physical ability to use computers.

We asked FRs what we could do to make the test more successful. They said the software needed to be more friendly. They couldn't move beyond the software to properly evaluate the devices. They also thought they needed more time to play with it. Solitaire got them used to the feel but they still needed more time. They also thought it would be good to use the machine they used on the first day again. This would mean expanding the test to three full days. On the morning of the third day, allow the FRs to use the first device or even both devices again and then debrief in the afternoon.

The FRs final comments concerned the big picture. They said when evaluating these devices we also need to consider the transmission and flow of data. They also wondered how crew leaders would evaluate the work of their enumerators.

Observer Feedback

Observers were members of the test plan team and of the parent MCD working group or other R & D groups. Observers30

 escorted the Field Representatives while interviews were completed.

At the completion of each day's activities each observer completed a feedback form. The observer feedback forms were intended to capture the observers perception of the experience that the FR/SFR had with various components of the software and hardware. In total 26 observer feedback forms were collected and tallied. By and large, the results that were reported on the observer feedback forms mirrored those reported by the FR's/SFRs

- The observers reported that FR/SFR's had some problems or frequent problems reading the screen of the MCD outdoors in sunlight and to a lesser extent in shade.
- The observers reported that most FR/SFR's had few problem with the standard tasks such as opening and closing the software turning on the machine etc.
- The observers reported that FR/SFR's had few problems inputting information into the MCD however the observers reported more than half of theFR/SFR's had some problems navigating through the form.

Specific results of these tallies can be seen in Tables 1 and 2 on the following pages.

Mobile Computing Device (MCD) Short Form Test
Observation Checklist

Observer:	Date: ☐ Wed, 6/26 ☐ Thurs, 6/27		
FR:	Machine ☐ Jornada 720 (clamshell) ☐ Jornada 564 (handheld)		

Task Specific Information from Today's Interviews			
How often did the FR experience problems FR with the following:			

• **Touch screen**	Rarely/Never	Sometimes	Frequently
• **Stylus**	Rarely/Never	Sometimes	Frequently
• **Keyboard**	Rarely/Never	Sometimes	Frequently
• **Opening Field Worker software**	Rarely/Never	Sometimes	Frequently
• **Opening cases in Field Worker software**	Rarely/Never	Sometimes	Frequently
• **Using the time/date stamps**	Rarely/Never	Sometimes	Frequently
• **Using scroll up and scroll down function**	Rarely/Never	Sometimes	Frequently
• **Using scroll left and scroll right function**	Rarely/Never	Sometimes	Frequently
• **Selecting items using a check box**	Rarely/Never	Sometimes	Frequently
• **Selecting items from a pick list**	Rarely/Never	Sometimes	Frequently
• **Selecting items from a pick list within a pick list**	Rarely/Never	Sometimes	Frequently
• **Reading questions as worded**	Rarely/Never	Sometimes	Frequently
• **Inputting text**	Rarely/Never	Sometimes	Frequently
• **Inputting numbers by typing**	Rarely/Never	Sometimes	Frequently
• **Inputting numbers using numeric slide**	Rarely/Never	Sometimes	Frequently
• **Navigating through the form**	Rarely/Never	Sometimes	Frequently
• **Using the signature feature**	Rarely/Never	Sometimes	Frequently
• **Closing the interview**	Rarely/Never	Sometimes	Frequently
• **Reading the screen outdoors in sunlight**	Rarely/Never	Sometimes	Frequently
• **Reading the screen outdoors in shade**	Rarely/Never	Sometimes	Frequently
• **Reading the screen in flourescent light**	Rarely/Never	Sometimes	Frequently

• **Conducting the interview while standing**	Rarely/Never	Sometimes	Frequently
• **Power Supply**	Rarely/Never	Sometimes	Frequently
General Impressions of Today's Interviews:			
Overall, how easy was it for the FR to conduct interviews using the device?	Had No Difficulty	Had Some Difficulty	Had Much Difficulty
What was the FR's overall confidence level when using the device?	High	Medium	Low
How long did it take the FR to become comfortable using the device?	By Middle of Day	By End of Day	Was Never Comfortable
Overall, how physically comfortable did the FR appear to be when using the device?	Always Comfortable	Sometimes Comfortable	Uncomfortable
How often did the FR make eye contact with the respondent after reading the question?	Always/Most of the Time	Sometimes	Rarely/Never
How often did the FR experience error messages?	Rarely/Never	Sometimes	Frequently
Generally what was the confidence level How often did the FR experience error messages?	High	Medium	Low
What was the FR's overall frustration level when using the device?	Low	Medium	High

Describe the conditions under which the FR had problems: (For example: "The FR had problems with screen glare while outside in direct sunlight")

Describe any comments the FR made relating to:

• Physical comfort of the device: (ie; weight, problems handling stylus, etc.)

• Hardware: (ie: keyboard, auto turn off etc.)

• Software: (ie: Field Worker problems)

- Ease of use:

- Difficulty of use:

- Any other comments?

Mobile Computing Device (MCD) Short Form Test
Results from Observer Feedback Form

Table 1. Observer Feedback about MCD Hardware and Software Elements									
Hardware/Software Element by Machine Type	# of Observers who reported the FR "Rarely/Never" Experienced Problems			# of Observers who reported the FR "Sometimes" Experienced Problems			# of Observers who reported the FR "Frequently" Experienced Problems		
	564	720	Total	564	720	Total	564	720	Total
Touch screen	10	9	**19**	2	3	**5**	2	0	**2**
Stylus	13	11	**24**	0	1	**1**	1	0	**1**
Keyboard	10	12	**22**	2	0	**2**	0	0	**0**
Opening Field Worker software	14	10	**24**	0	2	**2**	0	0	**0**
Opening cases in Field Worker software	10	8	**18**	4	4	**8**	0	0	**0**
Using the time/date stamps	12	11	**23**	1	0	**1**	1	0	**1**
Using scroll up and scroll down function	9	7	**16**	4	4	**8**	1	1	**2**
Using scroll left and scroll right function	14	10	**24**	0	2	**2**	0	0	**0**
Selecting items using a check box	14	11	**25**	0	1	**1**	0	0	**0**
Selecting items from a pick list	11	10	**21**	3	2	**5**	0	0	**0**
Selecting items from a pick list within a pick list	12	10	**22**	2	2	**4**	0	0	**0**
Reading questions as worded on form	9	9	**18**	4	2	**6**	1	1	**2**
Inputting text	10	9	**19**	4	2	**6**	0	1	**1**
Inputting numbers by typing	11	11	**22**	3	1	**4**	0	0	**0**
Inputting numbers using numeric slide	9	9	**18**	3	2	**5**	1	1	**2**
Navigating through the form	5	5	**10**	9	5	**14**	0	2	**2**
Using the signature feature	13	11	**24**	1	1	**2**	0	0	**0**
Closing the interview	12	10	**22**	1	1	**2**	1	1	**2**
Reading the screen outdoors in sunlight	9	1	**10**	2	2	**4**	3	8	**11**
Reading the screen outdoors in shade	8	2	**10**	2	7	**9**	4	3	**7**
Reading the screen in fluorescent light	11	11	**22**	2	0	**2**	1	0	**1**
Conducting the interview while standing	12	9	**21**	2	2	**4**	0	1	**1**

| Power Supply | 12 | 11 | **23** | 2 | 0 | 2 | 0 | 0 | **0** |

* Response numbers are based 26 Observer Feedback forms collected after each day's testing.   Note: Some feedback forms had "no answer" for some questions so the sum total of responses is occasionally less than 26.

Table 2. Observers "General Impressions" Feedback about FR's Experience									
Question from Observation Form	**# of Reported FR Observations by Machine Type***								
	720	**564**	Total	**720**	**564**	Total	**720**	**564**	Total
Overall, how easy was it for the FR to conduct interviews using the device?	"Had No Difficulty"			"Had Some Difficulty"			"Had Much Difficulty "		
	6	5	**11**	6	6	**12**	0	0	**0**
What was the FR's overall confidence level when using the device?	" High"			"Medium"			" Low"		
	11	6	**17**	2	6	**8**	0	0	**0**
How long did it take the FR to become comfortable using the device?	"By the Middle of the Day"			"By the End of the Day"			"Was Never Comfortable"		
	12	11	**23**	1	1	**2**	0	0	**0**
Overall, how physically comfortable did the FR appear to be when using the device?	"Mostly Comfortable"			"Sometimes Comfortable"			"Uncomfortable"		
	11	9	**20**	3	3	**6**	0	0	**0**
How often did the FR make eye contact with the respondent after reading the question?	"Always/Most of the Time"			"Sometimes"			"Rarely/Never"		
	6	5	**11**	5	5	**10**	3	1	**4**
How often did the FR experience error messages?	"Frequently"			"Sometimes"			"Rarely/Never"		
	6	7	**13**	7	2	**9**	1	2	**3**
Generally what was the confidence level How often did the FR experience error messages?	" High"			"Medium"			" Low"		
	5	4	**9**	3	3	**6**	2	1	**3**
What was the FR's overall frustration level when using the device?	" High"			"Medium"			" Low"		
	0	0	**0**	1	2	**3**	13	8	**21**

* Response numbers are based 26 Observer Feedback forms collected after each day's testing. Note: Some feedback forms had "no answer" for some questions so the sum total of responses is occasionally less than 26.

Debriefing of Observers
MCD Short Form Test
June 28, 2002

Physical Features

- **720 — FR kept hitting the buttons (on the machine) in top right hand corner; While adjusting the screen hit other buttons**
- **Frustrated with using other buttons (functions)**
- **564 — never had a problem reading the screen**
- **720 — hard to read the screen**
- **564 — clearer**
- **720 — harder to read**
  Had to move the MCD around to read in different lighting conditions
- **720 — fumbled with stylus; had to think of which to use — stylus or keyboard**
  Used stylus, fingers for typing
- **Never used finger on screen**
- **720 — keyboard easier to see**
- **564 — virtual keyboard hard to see**
- **720 — liked machine but heavy**
- **564 — wanted larger font on virtual keyboard**
- **720 — too heavy after 7 minutes**
- **720 — liked using the battery for grasping the 720**
- **720 — FR got tired of holding — "flexed" hand**
- **720 — seemed faster — closer to the 7 minute time that we told FRs it would take**
- **564 — virtual keyboard covered the questions**
- **564 — after training seemed ready to interview**

Navigation
- **Processing speed needs to be faster**
- **Need feedback — hourglass; working**
- **Test machines on people with no census experience**
- **Consider FR skill set**
- **564 — stylus may need a finer point**
- **MCD should have different slots (more than one) for stylus**
- **Stylus -- take out and put back in; put it in at end of interview; they stored it**

Input Methods

- **564 — Race box took up whole screen**
- **720 — screen larger**

    Scroll bar too close to "X"
- **Did not like slide bar**
- **Wanted consistent input methods throughout**
- **Instrument should skip to next question automatically**
- **720 — respondent seemed to participate more because they could see the screen**
- **564 — no eye contact**
- **564 — signature worked well**
- **Certification took about one minute and 15 seconds**
- **Time on interview may not be accurate — interview took 11 minutes but by the time the FR made small talk with the respondent and closed out the interview, it said it took 19 minutes**
- **FRs got better the second day**
- **On the List/Data/Link drop down box, sometimes the FR would drag the stylus (instead of tapping on one option) which caused them to select the wrong option**
- **More "Solitaire" practice to drag vs. drop**
- **Response categories should not scroll**
- **When picking responses, you should only be able to choose response categories (i.e., not the question)**
- **Visually separate the question from the response (not necessarily on separate screens)**
- **Software needs to be more intuitive**
- **Clearing or deleting data was difficult — need more training, better design, usability testing**

Preference for style of machine
- **10 observers said the 564 seemed easier to use; 3 said the 720 was easier; 2 did not vote**
- **voted for the 720 because of larger screen; would get more votes if processor speed improved and display was better in different lighting conditions**
- **those who voted for the 564 said it was ergonomically more pleasing, lighter, and you could see it in the sun --lighter, brighter, faster.**
- **could put the 564 in pocket; had to carry the 720 like a book; one observer was asked to hold the 720 but not the 564 (implying weight was an issue)**

Training
- **Observers thought that problems encountered could be resolved by training**
- **Need a "Fisher-Price/ATM" device/instrument — e.g., simple, one button**

    no X on bottom

    tailor design to be simple

    contrast button

       eliminate X

       be prepared for FRs getting lost in the machine

       need support

- **Need more practice interviews**
- **Need more experienced people to keep up with the trainees (e.g., helpers)**
- **Room has to have space for trainer/helper to move around the room**
- **Solitaire helped people get used to the machine**
- **More testing with different age groups**

General Comments

- **One unit was dropped (564)**
- **Have observer observe same person throughout the test**
- **Spend same amount of time on each device**
- **Use people who represent the general workforce**
- **Observers should consider FR health problems**